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CROP WATCH

University of Nebraska Cooperative Extension
Institute of Agriculture and Natural Resources

No. 2002-7
April 26, 2002

5-year corn/sorghum trials prove value of each

Five years of University of Nebraska side-by-side corn and sorghum trials indicate both crops have a place in Nebraska's fields.

In NU Cooperative Extension field trials in south central and southeast Nebraska since 1997, crop specialists compared the productivity of corn and sorghum side by side in dryland farmers' fields. They used management practices appropriate to each crop and area. Research found sorghum usually yielded better in fields expected to yield below 120 bushels per acre. However, if yields are expected to be above 140 bushels per acre, corn usually will yield more, said Steve Melvin, extension educator in Frontier County and formerly an extension educator in Nuckolls County, where some of the research was conducted. The yields in the 120 to 140 bushels per acre

The lower cash price for sorghum is offset by equally lower production costs.

range would be similar for the two crops.

The 2001 results in south central Nebraska show when it is fairly dry during the corn grain-fill period and extremely dry later during the sorghum grain-fill period, corn will outyield sorghum, Melvin said. The

previous years' data show the opposite is true with a little rain later in the summer.

These trials emphasize there are distinct advantages to having both corn and sorghum in the same year, said Roger Elmore, crops specialist at the South Central REC near Clay Center.

"You don't know what kind of weather you'll have. Planting corn and sorghum spreads out the risk and provides excellent crop rotation benefits," he said.

IANR specialists have rotated

(Continued on page 63)

When temperatures dip in late April, do crops do the same?

How low the temperature goes and how long it stays there are the first concerns for possible frost injury to crops at this time of year. Other important factors to consider are the position of the growing point and the soil moisture present.

The growing point for recently planted corn is near where the seed was planted. If there was some soil moisture, especially from a recent rain, there should be little damage from the frost. Recent tillage also can affect the potential for damage by creating a direct path from the cold air down into the soil and seed cavity. At this point, however, even if the leaves have emerged and are burned back, there should not be

any permanent damage to the plants.

Spring grains such as oat and spring wheat are able to tolerate fairly low temperatures at their current growth stage. Winter wheat will tolerate low temperatures as long as the growing point is near ground level. The growing point will not be in danger until it gets close to the boot stage. Even then it is quite well protected. It becomes very vulnerable after the head has emerged and pollination is taking place. No place in Nebraska has reached that point.

**Lenis Nelson, Extension
Crop Variety and
Seed Production Specialist**

Focus on: Grain sorghum

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Management tips May 1-15

One-half inch or more of rain or irrigation within four days of a surface application of manure moves the manure ammonium-nitrogen into the soil. This is equal to incorporation for ammonium availability; however, more ammonium is lost with each day of delay. Manure incorporation is not needed to utilize the organic-N credit.

For more information check the NU NebGuide "Determining Crop Available Nutrients from Manure", G97-1335-A, available from your local Cooperative Extension office.

Field briefs

Jason Larson, Extension educator in Custer County: We still need significant precipitation in this area. Most of the county received about 1/2 inch of rain last weekend, but we still need more. Corn planting began Monday for many farmers. Alfalfa and wheat are looking okay, given the boost in moisture from last weekend. Many pivots were running in alfalfa fields last week. Some alfalfa was treated for army cutworm, but it was not a large problem.

Al Dutcher, state climatologist, School of Natural Resource Sciences: In the last week, officials in Colorado and Wyoming declared their states to be in drought emergencies and began the process for seeking federal assistance. While historically it may be a little unusual to declare a drought before the crop growing season begins, a significant lack of snowfall last winter led to the decision. Stream flows are reported to be below normal across much of the western United States, and Colorado is already reporting an increase in the number of wildfires.

Hundreds of searchable
NebGuides on the Web at:

www.ianr.unl.edu/pubs

Field scout training May 13

A one-day Field Scout Training course will be held May 13 at the University of Nebraska's Agricultural Research and Development Center near Mead.

The program, which will be held from 8:30 a.m. to 5 p.m., is designed for entry level scouts who will be working for crop consultants, industry agronomists and farm service centers across Nebraska and neighboring states, said Keith Glewen, program co-coordinator and NU extension educator. Trainers are NU faculty and representatives from ag industry.

Topics include: corn and soybean growth and development — how to stage the growth of corn and soybeans and why this is important to pest control; corn and soybean insect pests — identification, damage and life cycles; natural enemies — predators, parasites and pathogens; weed identification; crop diseases; nutrient deficiencies; and sampling methods including scouting do's and don'ts. Past participants give the training high marks, Glewen said.

Registration is \$65 before May 7 and \$75 after. A total of 5.5 CCA credits is anticipated for Integrated Pest Management 4.0, Crop Production, 1.0 and Soil Fertility .5.

This training is part of the NU Cooperative Extension Crop Management Diagnostic Clinics. Three other clinics are planned. A mid-summer diagnostic clinic July 18 will include: crop production management decisions, soybean pests, sprayer management, fertilizer application equipment, crop nutrient management planning, herbicide mode of action, insects, diseases and weeds.

The Aug. 20 clinic will address late season pest management, nutrient management, and tillage options and the Sept. 4 clinic will be on precision farming.

For more information or to register, contact NU's ARDC, 1071 County Road G, Ithaca, Neb. 68033 or call (402) 624-8030, fax (402) 624-8010, e-mail cdunbar2@unl.edu or visit the World Wide Web at <http://ardc.unl.edu/crop.htm>.

**Sandi Alswager, Newswriter
IANR News and Publishing**

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Sorghum trials *(Continued from page 61)*

field trials in Gage, Lancaster, Nuckolls, Otoe and Webster counties over the past five years.

The 2001 trials were in Webster and Lancaster counties. In Webster County, where it was extremely hot and dry during late summer, 18 corn hybrids were planted in the same field with 19 sorghum hybrids. Both crops were planted no-till into wheat stubble. Corn yields ranged from 108 to 160 bushels per acre with an average of 138 bushels per acre. Sorghum yields ranged from 108 to 148 bushels per acre with a 135-bushel per acre average.

In Lancaster County, which also was dry much of the summer, 60 corn hybrids and 35 sorghum hybrids were no-tilled into bean stubble. Corn yields averaged 129 bushels per acre and ranged from 104 to 171 bushels per acre. The sorghum plot had a poor stand and only 11 commercial hybrids were included in these comparisons. They averaged 115 bushels per acre and ranged from 95 to 131 bushels per acre.

The last five years of data from Nuckolls and Webster counties show

sorghum yielding 126 bushels per acre and corn 112 bushels per acre, giving sorghum a 14 bushel per acre advantage over corn.

Three years of data from Gage, Lancaster and Otoe counties resulted in 139-bushel-per-acre corn yields and 130-bushel-per-acre sorghum yields, giving corn a nine-bushel-per-acre advantage at these higher yields.

The plots in south central Nebraska were planted no-till into wheat stubble each year except 1997 when the stubble was disked once. The southeast plots were planted no-till into soybean stubble two out of the three years. The excellent yields in these plots are directly related to the water saving practice of no-till farming, Melvin said.

"Another observation from these trials is that dryland corn hybrid selection is more critical than for grain sorghum," Melvin said. "The variation between the top and bottom yielding corn hybrid was 20 bushels per acre more than for the sorghum."

Grain sorghum seed costs less than seed corn, which leads to lower overall production costs than with

corn. The lower cash price for sorghum is offset by equally lower production costs, these trials showed. If yields are similar for corn and sorghum, returns are similar. So, if sorghum outyields dryland corn, it will produce better returns.

The market price also makes a difference. During the last couple of years, grain sorghum prices have been a few cents a bushel below and occasionally above corn prices, said Roger Selley, extension farm management specialist.

Traditionally the grain sorghum price is based on the feed value and sorghum is less valuable for a feed source. However, today other factors are influencing grain sorghum prices. For example, grain sorghum is a better base for dog food and more is being exported to Mexico, he said.

"The price depends on what's happening in the market place now," he said. "There's been a shift, but the question is how long these conditions will prevail."

Sandi Alswager
Newswriter

IANR News and Publishing

Controlling cattails in lagoons and ponds

How to control cattails is a popular question posed to many Cooperative Extension offices. Several methods can be used; the feasibility of each method depends on the size of the infestation. The important thing as always is that you use the right treatment at the right time.

Mechanically removing the tops. Cattails can be kept in check, and eventually controlled, by repeatedly cutting the tops. If possible, cut plants below the water line. If they must be cut above the water line, raise the water level in the lagoon to submerge the cut stems at least 8 inches. Research in Iowa (Weller, 1975) found that cutting shoots two or three times during the growing season before flower production reduced a cattail stand by 95-99% in one year. A single cutting in August followed by submergence resulted in 80% control. It is important to remove all dead and live cattail stems to achieve this control.

Power equipment that has been used to cut cattails includes tractor-mounted sickle mowers and hand-operated power trimmers equipped with metal cutting wheels instead of strings. Hand scythes, machetes (corn knives) and long-handled shovels also have been used to manually cut cattails close to the shoreline.

Hand pulling. Where feasible, pulling rather than cutting will result in faster control because the plant structures (crowns, rhizomes, and roots) which store the energy will be removed. Repeated pulling so plants never grow taller than 3 feet above the water surface will prevent seed production. Sometimes the rhizomes become so intertwined, it is nearly impossible to pull the plants out by their roots. In this case, use a shovel to first divide the clumps into square foot sections and then pull them.

Using a contact herbicide. A contact herbicide only kills the green tissue that comes in contact with the herbicide and does not move through the plant as a systemic herbicide does. Thorough coverage of the green tissue is essential for effective control. Expect plants to regrow from the roots. Treat three to four times during the growing season to prevent seed production and to eventually starve the root system.

Reward is the most common contact herbicide used. Use 1 to 2 quarts per acre broadcast in at least 50-100 gallons of water or 0.75 oz per gallon for spot spraying to

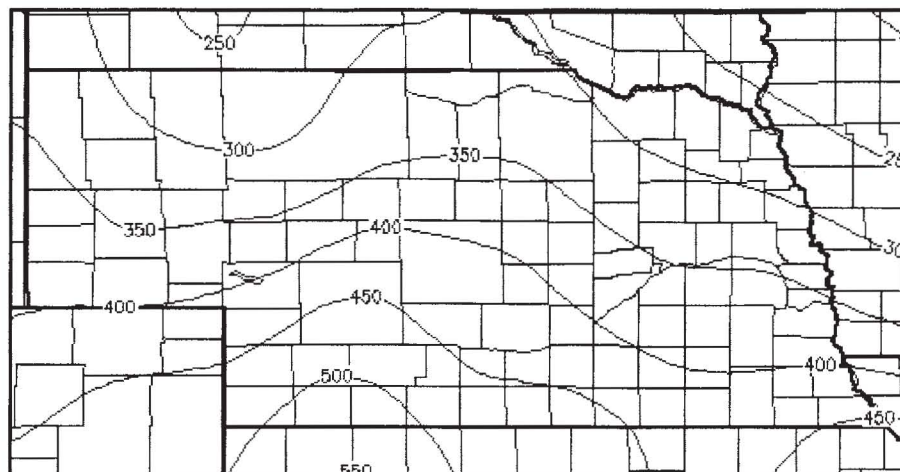
(Continued on page 66)

Start scouting for alfalfa and clover leaf weevils

Over the last decade, large-scale alfalfa weevil problems have not occurred in Nebraska; however, there have been locally damaging infestations in some areas, particularly parts of the Panhandle and in Boyd and Holt counties. These areas were particularly hard hit in 1998 and have had some problems since. Predators and other natural enemies seem to have stabilized alfalfa weevil populations, but occasionally things can get out of balance (remember the caterpillar explosion last year). While we don't know if alfalfa weevils or clover leaf weevils will be a problem this year, if you're growing high quality alfalfa hay, take the time to monitor fields for the next month.

According to growing degree accumulations, alfalfa weevil activity should have begun in most of the state by now. Weevil larvae usually begin causing noticeable damage at about 350 GDD (48 degree base).

Clover leaf weevils (CLW) are occasionally a problem in dry springs but are very vulnerable to a fungus disease, and so haven't been pests since the late 80s early 90s when spring rains were rare. Clover leaf weevil larvae will be in the debris around the crowns during day. Scratching in the soil around the crowns and counting the number of



This map shows accumulated growing degree days base 48 as of April 22. Most of the state has passed the 350 GDD threshold and scouting should be underway for alfalfa weevils. (Map prepared by Al Dutcher, State Climatologist, NU School of Natural Resource Sciences.)

larvae found per crown will help give a better idea of clover leaf weevil infestation. Their brown heads will help distinguish them from the black headed alfalfa weevil. The chart below compares the alfalfa and clover leaf weevil.

Both the alfalfa weevil and clover leaf weevil feed on first cutting alfalfa as larvae and regrowth of the first cutting as adults. While research conducted in northeast Nebraska has shown that clover leaf weevil larvae

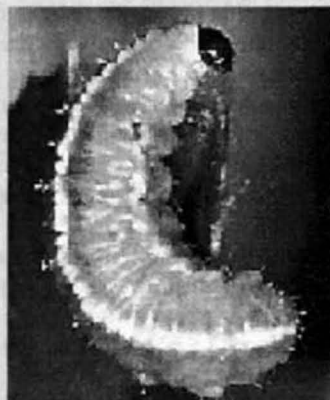
feeding does not cause yield reduction to first cutting alfalfa, alfalfa weevil feeding can cause severe losses to yield and quality of the first cutting.

Weevil management

Several methods can be used to reduce weevil populations. At this time of year, economic infestations are usually dealt with by insecticide use or early harvest, depending on the

(Continued on page 65)

Comparison of alfalfa weevil to clover leaf weevil



Alfalfa weevil larva

Alfalfa weevil

Overwinter primarily as adults
Adults brown with dark brown stripe halfway down back, 3/16 inch long.
Larvae prefer to feed on tips.
Larvae remain on plant most of the time.
Larvae have black heads.
Adults leave fields in June.

Clover leaf weevil

Over winter primarily as larvae.
Adults dark brown, pitted light brown underneath, over 1/4 inch long.
Larvae feed anywhere on plant.
Many larvae in soil or debris during daytime hours.
Larvae have brown heads.
Adults may remain in fields.

Top producer tips for high-yielding grain sorghum

Top grain sorghum producers shared tips for increasing yields at this year's grain sorghum conferences. They have achieved success despite current barriers to sorghum production, including yields and technological advances which have not increased at the same rate as corn and a farm program which offers fewer protections. Their suggestions – grouped into areas of influence – follow:

Don't treat the crop as a second rate, cheap alternative for use on the poorest cropland. Milo will need 1.1 pounds of nitrogen per bushel of expected yield. The exact choice of nitrogen is not important, but it is important that it be properly applied to avoid any losses. Phosphorus response in grain sorghum is quite high, particularly on poorer fields. Most top producers are not satisfied with low or medium phosphorus tests on owned land. They would like to move those soil test levels to almost 20 ppm. Starter fertilizer provides

for readily available nitrogen and phosphorus. By helping the plants get off to a fast start it also will reduce weed competition. In addition, crop rotation is a must for most producers.

Selecting top hybrids is vital. Most top producers rely on company representatives for information, but they also often have a healthy tendency to conduct strip trials and review as much data as possible from other trials. There is a mixed response to Gaucho use, unless the area is near a wheat field. Wireworm seems like the greatest concern in stand establishment. Greenbug protection is provided by scouting and treatment versus variety selection for resistance.

Top planter operation and proper depth control are a must to top production plans. Most, but not all, top producers no-till grain sorghum into wheat stubble and soybean stubble. Most producers are planting from 75,000 to 85,000 seeds per acre in southeast Ne-

braska and 50,000 to 70,000 in south central Nebraska. Most producers like mid to mid late season hybrids and like to plant in the first 20 days of May.

Weed control is essential and top producers are vigorous in keeping the field clean, especially for annual grasses. Since grain sorghum has a more limited selection of herbicides than corn, it's important to use what tools are available in the best way. Early preplant herbicide applications limit weed development. Many producers will split applications or be vigorous in their use of early post treatments to eliminate grass escapes.

The only answer to the government farm program issue is to be sure yields are reported for crop insurance to get the protection level up. It will be a great help if sorghum and corn loan rates are equalized.

**Paul Hay, Extension Educator
Gage County**

Alfalfa weevils *(Continued from page 67)*

alfalfa's height. Other non-chemical control methods that have been used for alfalfa weevil management include flaming, flooding, crushing of eggs and larvae, disking or harrowing, seeding dates, and use of resistant varieties. The easiest way to begin weevil management is to select a resistant or tolerant variety that will yield well in your area. The grazing of alfalfa in fall and winter is becoming more popular and will reduce overwintering egg populations, particularly in southern areas where a significant number of eggs, as well as adults, may overwinter. In a recent Oklahoma study, cattle reduced the density of weevil eggs by over 60%. Grazed alfalfa may not be as attractive to egg-laying females in the spring although more research needs to be

done to determine the factors involved. It is essential that fields be monitored for alfalfa weevil feeding now. Damage consists of small holes and interveinal feeding on the newest leaflets near the stem tips. The larvae are small (1/16 to 3/8 inch in length) and a pale yellowish green, which turns to a darker green when they are larger. These legless worms have black heads and a white stripe the length of the back. The alfalfa weevil larvae, which curl into a C-shape when disturbed, spend nearly all their time on the plant.

Once the alfalfa is about 4-6 inches high, take a bucket, carefully cut some stems at ground level (30 to 50 per field, from various spots in the field) and shake the stems against the side of the bucket. Average the

number of weevil larvae per stem. Use these charts to help you determine whether control is necessary. Each chart has been developed for a specific alfalfa value. The decision as to whether to treat or re-sample depends on the average number of weevils per stem, the stem length, and the value of the alfalfa. When alfalfa reaches a certain height, it may be more profitable to cut the alfalfa early rather than treat. Insecticides registered to control alfalfa weevil larvae include Ambush, Baythroid, Cythion, Furadan, Guthion, Imidan, Lannate, Lorsban, Mustang, Penncap M, Pounce, Sevin, and Warrior. See the Entomology Web site at <http://entomology.unl.edu/instabls/instabls.htm> to check for use rates.

**Keith Jarvi, IPM Extension
Assistant, Northeast REC**

Dryland yields suggest effects of rotations

From 1994 through 2001, I gathered yield, prior crop and tillage data on more than 1250 fields in greater Gage County. As you can tell by the charts, some rotations have limited numbers of fields. The table columns labeled "Conv. Till" and "No-till" indicate yield in bushels per acre. While many factors such as fertilization, crop variety, field history, etc. are missing in this data set, it does provide some insight into these production factors. The entire data set including some irrigated fields is available on the Gage County Web site at <http://gage.unl.edu>.

Soybeans

Crops	Stubble	# Fields	Conv. Till	# Fields	No-till
Soybean	Corn	105	40.0	113	39.9
Soybean	Soybean	32	37.8	17	37.8
Soybean	Milo	63	36.8	48	38.4
Soybean	Wheat	19	41.9	10	42.1

Soybeans do respond a little bit to rotation with corn, but don't respond as much to a grain sorghum rotation. All the good soil and moisture protection in wheat stubble does little to help the bean yield. It appears to me that soybean yield is determined by factors other than rotation and tillage, such as whether it rains in August when the crop needs it most. Like does it rain in August.

Wheat

Crops	Stubble	# Fields	Conv. Till	# Fields	No-till
Wheat	Corn	4	44.0	2	41.0
Wheat	Soybean	21	39.6	44	38.0
Wheat	Milo	5	41.0	2	40.0
Wheat	Wheat	40	43.3	1	39.0

Wheat is like soybeans. It appears that factors of fall moisture, winter exposure, leaf diseases, and early summer heat are larger than crop rotation and or tillage method. Many farmers have said that wheat on wheat is the best alternative; however both this data and the corn data suggest otherwise.

Cattails *(Continued from page 63)*

either add 0.25% to .50% solution (1 or 2 quarts per 100 gallons) of non-ionic surfactant (such as X-77).

Using a systemic herbicide. Systemic herbicides applied to the foliage are absorbed into the plant tissues and then moved (translocated) throughout the entire plant. The optimum treatment period is from late boot stage (noticeable bulge caused by the flowering structure growing up through its protective sheath) to early flowering (green cattail head freshly emerged from the boot).

Typical products include:

2,4-D ester (4L) + Methylated seed oil (MSO) or crop oil concentrate (COC). Use 1.5 gallons per acre in at least 150 gallons of water (carrier) for broadcast or a 1% 2,4-D

Corn

Crops	Stubble	# Fields	Conv. Till	# Fields	No-till
Corn	Corn	35	105.5	17	108.4
Corn	Soybean	111	116.1	154	119.9
Corn	Milo	11	98.7	5	87.4
Corn	Wheat	40	117.3	33	134.3

Corn appears to respond to crop rotation and tillage method. The 11-bushel-per-acre increase in corn-soybean rotations, versus corn on corn is impressive and consistent with many past UNL and KSU studies. While data is limited, the data for corn after grain sorghum is worrisome. It's clear that if you raise wheat, no-tilling into wheat stubble is superior to using tillage. Apparently the residue cover and moisture conservation are significant factors.

Grain sorghum

Crops	Stubble	# Fields	Conv. Till	# Fields	No-till
Milo	Corn	7	77.7	3	102.0
Milo	Soybean	69	83.4	45	99.8
Milo	Milo	39	75.5	17	85.3
Milo	Wheat	28	93.0	25	107.2

This data set mirrors the responses we saw in corn. It is best to rotate with legumes or a grass cover like wheat. It also is clear that there are yield advantages to using the no-till systems.

Paul Hay, Extension Educator, Gage County

solution for spot spraying. To either add 0.5% of MSO or COC.

Aquamaster™ or aquatic glyphosate + non-ionic surfactant (NIS). Use approximately 4.5-6 pints per acre broadcast or 0.75% solution (1 oz per gallon) for spot spraying. To either add 0.5% solution of NIS.

Be sure you only use glyphosate products registered for aquatic uses. As always read and follow all label directions and use restrictions.

**Tom Dorn and Don Janssen, Extension Educators,
Lancaster County
Brady Kappler, Weed Science Educator**

Forecasts offer hope of precipitation

Dry conditions continue to plague the state, even after several storms passed through. Severe thunderstorms formed across central Nebraska and raced rapidly eastward dumping brief, heavy rain, hail, and strong straight line winds April 16. In addition, there was a steady rain occurred across eastern Nebraska April 20-21.

Total precipitation for April 16-21 generally ranged from 0.50 - 1.00 inch across the eastern half of the state. Northeast Nebraska received the most generous amounts, with totals decreasing considerably toward western Nebraska. The recent activity has provided some surface moisture for planting, but has not reduced drought concerns.

The Nebraska Agricultural Statistics Service (NASS) reported dismal topsoil and subsoil levels for most of the state as of April 21. The percent of fields reporting topsoil as short to very short are: Panhandle (64%), north central (26%), northeast (42%), central (90%), east central (64%), southwest (89%), south central (89%), and southeast (53%). Subsoil condition continues to remain poor with the percentages of fields reporting short to very short conditions as follows: panhandle (70%), north central (42%), northeast (43%), central (89%), east central (78%), southwest (74%), south central (84%), and southeast (63%).

To add insult to injury, snowpack in the Colorado and Wyoming mountains which feeds the Platte watershed was only 80% of what it was by the end of March last year. This represents less than 60% of the historical average. Even after a heavy snow April 19-21, snowpack water equivalents rose less than five percent. Streamflow projections for this summer are for less than 60% of normal flow if normal precipitation is received for the period.

It is anticipated that further reservoir draw downs will occur

this summer for Enders, Harlan, McConaughy, and Swanson. Irrigation delivery restrictions are a certainty for Enders and Swanson users, with initial estimates placing deliveries at six inches for the season. No restrictions are anticipated for McConaughy this year, but a below normal snowpack this winter would likely force authorities to visit the issue next spring.

Weather outlooks do offer some rays of hope. Forecasts for the next week point to several systems working across the state. Because of recent storm activity, there may be more moisture at the surface to feed these systems and improve rainfall prospects. The large temperature fluctuations experienced between each of the systems means that severe storm activity will likely occur.

It is important that these systems deliver rainfall in a consistent manner. Rainfall deficits for the year are running two to five inches across the state. This represents 30%-60% of normal precipitation, depending on location. Areas that have been hardest hit and need to see significant moisture are central and southwest Nebraska and the Nebraska Panhandle.

Precipitation outlooks for May do not give us any direction as there are equal chances of receiving below normal, normal, or above normal precipitation across the entire state. However, the 90-day outlook for the May - July indicates a tendency toward above normal precipitation for the entire state, with the highest probabilities assigned to the eastern two-thirds of Nebraska.

It is extremely unusual for 90-day outlooks to indicate a wet bias across the central Plains during the summer. Due to the nature of thunderstorm activity, models generally assign a climatology ranking to summer precipitation forecasts, meaning equal chances of

below normal, normal, or above normal conditions. That is precisely what the forecasts are indicating for the June-August, July-September, and August-October periods.

After analyzing the 90-day outlooks, it appears that the wet forecast for the May-July period indicates that June is contributing to the above normal tendency of the three-month precipitation forecast. However, it also indicates a bias toward drier than normal conditions in August. This would be consistent with a building El Nino event forecast to reach full maturity by December.

The one thing researchers are not clear on is how El Nino events will contribute to precipitation and temperature trends during the next 20 years. The Pacific Ocean has undergone a 20-year circulation oscillation from a warm phase to a cold phase. Since model input for long-lead outlooks favors the warm phase, there is some model uncertainty to whether the cool phase will exhibit similar climatic influences around the globe during El Nino events. Time will tell.

Al Dutcher
State Climatologist

New herbicides and label changes

Clearout 41 Plus is a isopropylamine salt of a glyphosate formulation being distributed by Zetachem USA. At this time it is labeled for non-crop weed control and Roundup Ready soybeans only.

Option is a new postemergence herbicide in corn that has just been labeled. It is being manufactured by Aventis and is a sulfonylurea herbicide with ALS mode of action. It's primary spectrum of control is grassy weeds.

Brady Kappler
Weed Science Educator

Musk thistle treatment should begin in early May

Musk thistle (*Carduus nutans* L.) is a noxious weed common throughout much of Nebraska. When musk thistle was introduced into the United States in the early 1900s, unfortunately its natural predators from western Asia did not come with it. In 1932, the first plant was identified in Nebraska and by 1959 musk thistle was declared a noxious weed here.

The key to good control of musk thistle with herbicides is to control young plants in early May while they're in the rosette stage. Treatment after bolting is less effective because seeds may still develop. Uncontrolled plants can produce up to 20,000 seeds.

Although musk thistle is not poisonous, livestock will not graze near the plants and may refuse to enter heavily infested areas. Musk thistle is highly competitive with desirable forage species for sunlight, moisture and nutrients.

Cultural control

Good management in cultivated crops usually retards musk thistle. Fields with heavy infestations could be cropped for a few years so tillage and herbicides could reduce infestations. Good grazing management also will retard infestations in grazing land. Grasslands grazed too closely are prime candidates for musk thistle infestation. Heavy livestock use opens forage stands to musk thistle, especially in moist areas.

Mechanical control

Musk thistle can be suppressed by mowing or shredding, resulting in reduced seed production. In most stands mowing at early bloom stage is best because plants will not resprout, although younger plants may require additional control measures (Figure 1). Cutting plants at the base will kill individual plants since they don't resprout from the roots. Seed may be produced by plants cut in full bloom so heads should be removed.

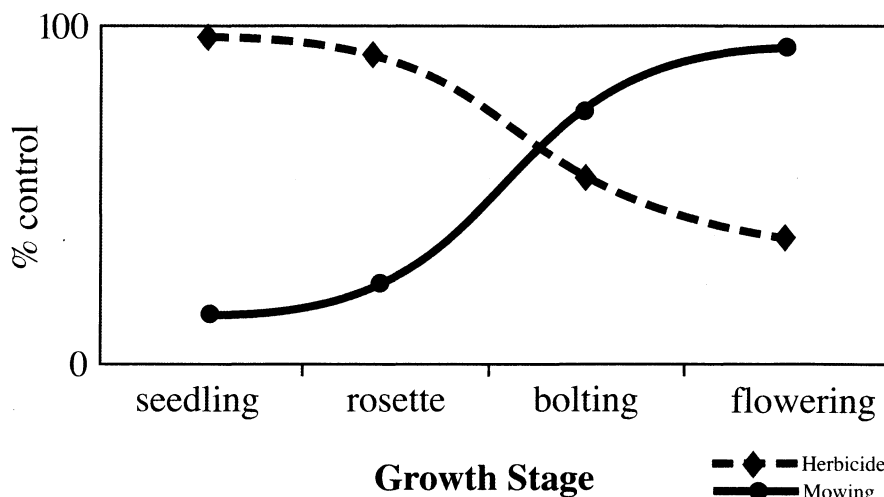


Figure 1. Musk thistle response to herbicide application and mowing at different growth stages.

Biological control

In 1972, the musk thistle seed weevil, a natural musk thistle predator, was introduced into Nebraska from southern Europe. The weevil larvae feed at the base of the flower and interfere with seed production. This approach can take six to eight years before an appreciable reduction is noticed. A minimum of 500 adults should be released in one area for control. For obvious reasons, this method is not compatible with mowing or spraying after plants bolt. However herbicides applied prior to musk thistle bolting are compatible with the weevil.

Chemical control

Several herbicides offer good control of musk thistle (Table 1).

Apply herbicides when plants are in the rosette stage and prior to bolting. Control declines with herbicide application after the rosette stage (Figure 1).

Grazing restrictions apply to the treatments described above so use caution. Lactating dairy animals should not graze for one week after a 2,4-D or Banvel application and two weeks after Curtail or Tordon. Hay harvest interval for lactating dairy animals for Banvel is 37 days, 2,4-D and Curtail is 30 days and Tordon is 14 days. Neither Ally nor Stinger have grazing or haying restrictions. Follow all precautions to prevent contamination of livestock and or hay.

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Table 1. Response of musk thistle to herbicides.

Herbicide control	Rate per acre	Timing	Percent
Ally	0.3 oz	Rosette	83-87
2,4-D amine	2 qt	Rosette	92-96
2,4-D + Banvel	1 qt + 0.5 pt	Rosette	92-95
Stinger	5.5 oz	Rosette	97-99
Tordon	8 oz	Rosette	96-98
Curtail	2 pt	Rosette	88-95